when used in its ordinary chemical sense of a root (Latin, *radicula*), basis, or common ingredient of a series of chemical compounds?

Surely the word is a substantive, and, like similar derivatives, should be spelt "radicle," and not as the adjective "radical." I hope, however, that those who spell it in the latter way will be able to adduce a partic*al* of reasoning in favour of their practice.

I am quite aware of the existence of a "leading artic*al*" called a "Radical" in politics; but in this case there is reference to one who desires a "radical" change in existing institutions. If, however, we are to consider him as "a common ingredient in a series of Caucuses," then I should maintain that here also the spelling should be amended. H. G. MADAN

Eton College, April 5

An Earthquake Invention

REFERRING to Prof. Milne's letter in NATURE of March 11 (p. 438), I have to say:—(1) That what I, as representing my father, have to complain of is that in a British Association Committee's Report describing experiments made with an aseismatic arrangement, and which appeared in the *Transactions* of the British Association of 1884, the writer thereof, who appears to have been Prof. Milne alone, did not acknowledge that Mr. David Stevenson had invented, described, and constructed precisely such apparatus in 1868, facts which Prof. Milne cannot deny, and yet took the honour to himself; and, when this was pointed out, he then set up a claim for Mr. Mallet which Mr. Mallet assuredly never made, and would have been the first to repudiate.

(2) Prof. Milne in that Report praised the aseismatic joint as a most useful invention, introducing a new and valuable principle of construction for earthquake-affected countries, and though he may now think otherwise, yet the account given in the Tsugisaki light-keeper's letter, quoted by him, of the effects of a shock at that lighthouse, in place of showing the uselessness of the apparatus, in my opinion proves the reverse, as the shock is reported to have been very severe; and had there been no aseismatic joint under the illuminating apparatus, it would have been so seriously damaged as to have been rendered useless, in place of which the light was only extinguished for five minutes.

Mr. Stevenson, in his original paper, with characteristic caution, carefully calls it an apparatus to *mitigate the effect of earthquake shocks*. Mr. Kinjero Fugicura, Engineer in Chief to the Lighthouse Department of Japan, writing January 11, 1886, says he is unable at present to give any definite opinion as to the merits of the aseismatic arrangements, because, since he put them in operation when he became Engineer in Chief, the occurrence of earthquakes has been very rare indeed; and further, he is of opinion that really to get at the bottom of the matter, two experimental tables would have to be placed at the same locality side by side, one with the aseismatic arrangements, and the other fixed, so that the behaviour of the two tables might be directly compared. To which I might add that the whole lighthouse (or any building of equal size), like that constructed and sent to Japan by my father, but which was unfortunately lost at sea, should be rebuilt and tried against ordinary houses unprovided with my father's invention.

(3) Prof. Milne asks what I claim as coming under Mr. Stevenson's invention. I claim of course everything which employs the same principle, and most distinctly the house carried on shot or "*cast-iron sand*," as Prof. Milne calls it, and which he lately erected in Japan, as well as the building described by him in the B. A. Report, p. 248, for 1884, as "resting on four cast-iron balls," and the action of which has been so perfect as to have actually "destroyed" all the "sudden motion or shock," and recorded by him as a notable earthquake.

I will not further trespass on your space, but refer your readers to the former correspondence on this subject in NATURE.

D. A. STEVENSON

84, George Street, Edinburgh, March 22

DR. T. SPENCER COBBOLD, F.R.S., F.L.S.

DR. COBBOLD was the son of the Rev. Richard Cobbold of Wortham in Suffolk. He was born in 1828, and educated at Charterhouse. He matriculated at the University of Edinburgh in November 1847, after having, in accordance with the mode of preparation for the profession of medicine then regarded as most advantageous, served a three years' apprenticeship with Mr. Crosse of Norwich, one of the most eminent and distinguished surgeons of his time. He thus came up to the University provided with a large amount of practical information, and even as a first year student possessed great dexterity in dissection and in the making of museum preparations, and was a skilful draughtsman. After working diligently for a year under Prof. Goodsir, he was appointed by that great anatomist as his prosector, and under his influence was led to abandon practical medicine for the more attractive study of morphology; his first original research being an anatomical essay on the Canal of Petit, which he offered as his graduation thesis, and for which a gold medal was awarded him by the Medical Faculty.

Like all other earnest Edinburgh students of that time he took an active part in the debates of the Royal Medical Society, and became in 1852 its senior President. In the same year, not many months after his graduation, he was appointed Curator of the Anatomical Museum, and became a prominent leader in the biological work of the School. As Curator he gave lectures on comparative osteology, and added largely to the collections. He also worked out the material for his article "Ruminantia," which appeared in the "Cyclopædia of Anatomy and Physiology" in 1856.

In 1856 Dr. Cobbold removed to London, and soon afterwards began to devote himself to the study of animal parasites, and particularly to the experimental investigation of their life-history, on which subject he made during the following years a number of important communications to the Linnean and other Societies. In 1864 his well-known work on "Helminthology" appeared, to which in 1869 he added a supplement containing his later researches. He subsequently published a manual of the parasitic diseases of domestic animals, a work on the grouse disease, and various other works relating to diseases of the same class.

In 1868 he was appointed by the Trustees of the British Museum to the Swiney Professorship of Geology, to which subject he had been led, under the influence of Prof. Edward Forbes, to devote much attention during his residence in Edinburgh. The greater number of these lectures were given at the Royal School of Mines, and were largely attended.

Dr. Cobbold's reputation as a comparative pathologist will rest on his treatise on the Entozoa. His most important contributions to morphology are his article on Ruminantia, his experimental researches on *Tænia mediocanellata* and other Cestodes, on Trichina, and on *Distoma hæmatobium*, and his recent paper on the parasites of elephants. His last communication to the Linnean Society was read on March 4.

THE GEOLOGISTS' ASSOCIATION AT THE SCIENCE SCHOOLS

ON Saturday, March 20, a party of over a hundred members of the Geologists' Association visited the Science Schools at South Kensington, by permission of the Science and Art Department, and were conducted over the building by Prof. J. W. Judd, F.R.S. The visitors met in the entrance-hall at 2.30, and then seated themselves in the large Chemical Lecture Theatre, where Prof. Judd gave a sketch of the history and development of the Schools and of the methods of study therein followed. At the conclusion of this address the party walked slowly through the various laboratories and lecture-rooms—metallurgical, physical, and chemical—gradually ascending to the upper stories of the lofty building, where are situated the biological and geological rooms. In one of

them a large collection of apparatus employed in various parts of the course was laid out.

Although not termed a museum, the teaching collections of minerals, rocks, fossils, &c., at the Science Schools are sufficiently full and complete for the most advanced student. Some time was spent in these rooms; as many of the members of the Association are engaged in teaching science they examined the arrangements with much interest. The elementary collections, which every student is required to know thoroughly, are arranged in table-cases always open to inspection; the more advanced collections are in drawers beneath. Over the table-cases and drawers which contain the fossils there are coloured vertical sections and diagrams of the geological formations and their subdivisions, showing the variations in their development in different districts.

In the Biological and Geological Lecture-Room an address was delivered by Mr. G. A. Cole, Prof. Judd's chief assistant, on "The Preparation of Microscopic Sections of Rocks and Minerals," illustrated by the apparatus employed and by drawings upon the blackboard.

From the lecture-room the party passed into the biological laboratory, upon the table of which, for this occasion, were placed a large number of microscopes, with sections of rocks and minerals, each with its name attached. From this the visitors passed into the advanced and research laboratories for geology, and thence down the main staircase to the entrance-hall.

PHOTOGRAPHIC STUDY OF STELLAR SPECTRA

Henry Draper Memorial

THE study of stellar spectra by means of photography was one of the most important investigations undertaken by the late Prof. Henry Draper. He was actively engaged in this research during the last years of his life. His plans included an extensive investigation, one object of which was to catalogue and classify the stars by their spectra. Mrs. Henry Draper has made provision, at the Observatory of Harvard College, for continuing these researches, as a memorial to her husband. The results already obtained, with the aid of an appropriation from the Bache Fund, permit the form of the new investigation to be definitely stated. The part of the sky to be surveyed is that extending from the North Pole to the parallel of 30° south declination. Each photograph will be exposed for about one hour, and will include a region 10° square. The telescope employed has an aperture of 20 centimetres (8 inches), and a focal length of 117 centimetres (44 inches). The object-glass is covered by a prism, and the resulting spectrum of each star in the region photographed has a length of about 1 centimetre; which enables the character of the spectra of stars from the fifth to the eighth magnitude to be determined. A modification of the apparatus is employed for the brighter stars.

Meanwhile, experiments are in progress with the 15-inch equatorial, with the object of representing the spectra of some typical stars upon a large scale. The spectra so far obtained are about 6 centimetres in length, and exhibit much well-defined detail. Additional experiments will be tried with a spectroscope provided with a slit, as well as with the simple prism hitherto employed, in order to secure the best possible definition. The present results encourage the expectation that the movements of stars in the line of sight may be better detert mined by the photographic method than by direc- observations.

To keep the astronomical public informed of the progress made in this work, specimens of the photographs obtained will be gratuitously distributed from time to time. The first of these distributions will probably be made in a few weeks. Owing to the expense of providing a large number of copies, it is desirable to limit the distribution, as far as possible, to those who are interested in this class of work. It is also desired, however, to send the specimens to all who will find them of value from the scientific point of view. A blank form of request is attached to the present circular, and may be filled out and sent to the Harvard College Observatory by any one desirous of receiving the specimens; but requests to the same effect in any form which may be convenient will also be cheerfully complied with so far as may prove practicable.

EDWARD C. PICKERING,
Director of Harvard College Observatory
Cambridge, U.S., March 20

SOLAR HALO WITH PARHELIA

ON Thursday, April 1, a solar halo with parhelia was seen here, in regard to which, with the consent of the Astronomer-Royal, I beg herewith to offer a few particulars. The best display occurred between 1h. 30m. and 2h. p.m., and at one time exhibited the following appearance. There was the large halo commonly seen, in addition to which a luminous ring passing through the sun encircled the sky, everywhere of the same altitude above the horizon, forming a small circle of the sphere taking the zenith as pole. On this, the parhelic circle, and outside of the halo by about 5°, a mock sun was seen both on the eastern and western sides; another was seen in about a north-north-west direction, and a fourth nearly east, both also situated on the circle.

Calling the real sun S, and the several mock suns, counting westward, S_1, S_2, S_3, S_4, differences of azimuth were independently estimated as follows:—

	S to S_2	S_2 to S_3	S_3 to S
	°	°	°
By myself, numerical estimation ...	115	130	115
By Mr. Nash, by estimation ...	120	120	120
By Mr. Lewis, measured from a sketch	123	115	122
Mean	119	122	119

apparently indicating that the true difference of azimuth was in each case 120°.

Mr. Turner states that S_4 was on the meridian at 1h. 55m., at which time the calculated azimuth of S from south was 36°, which is therefore the difference of azimuth between S_4 and S. I estimated this difference to be 31°, Mr. Nash 35°, and Mr. Lewis 35°. Mean = 34°. This azimuthal measure corresponds to about 27° as measured on a great circle at about the position of the sun. Deducting 5°, the estimated amount by which S_1 or S_4 was outside the halo, we have 22° for an approximate value of the radius of the halo, about the usual magnitude.

The evidence that the altitude of the circle on which the suns were seen was everywhere the same is as follows:—At 2h. the altitude of the sun, by direct calculation, was 37°. At the same time Mr. Turner, by measurement with the transit-circle, found the altitude of the circle at the point at which it crossed the north meridian to be 37°, it being well seen; its altitude on the south meridian appeared to be 40°, but the circle at this moment was not distinctly visible at this point. At 2h. 15m. Mr. Turner found, with the altazimuth, the altitude of both S_2 and S_3 to be 35°, which, allowing for change of altitude, gives 36½° for the corresponding altitude at 2h.

There were great variations in brilliancy of the different parts during the interval first mentioned, and some of the appearances were visible at a much later hour. The suns S_1 and S_4 at times exhibited prismatic colours in a marked manner.